EVALUATION OF A DE-IDENTIFICATION PROCESS FOR OCULAR IMAGING

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Introduction

Medical privacy of NASA astronauts is of utmost importance when data are being made available outside NASA systems, particularly to external clinical and research partners. Astronauts' personal and medical information is at a much greater risk of being exposed than the general population. This circumstance is due to a combination of factors, including a uniquely small patient population, extensive clinical and research test involvement, and cultural popularity. Therefore, care must be taken to ensure that the astronauts' identities are concealed. We have shown that a set of MRI images can be rendered to give an accurate representation of a patient's face., restricting NASA's ability to dispense these data to researchers without revealing the identity of the subject. In order to allow for expanded image sharing with external researchers, a method to de-identify images was developed, which is discussed here.

Aims

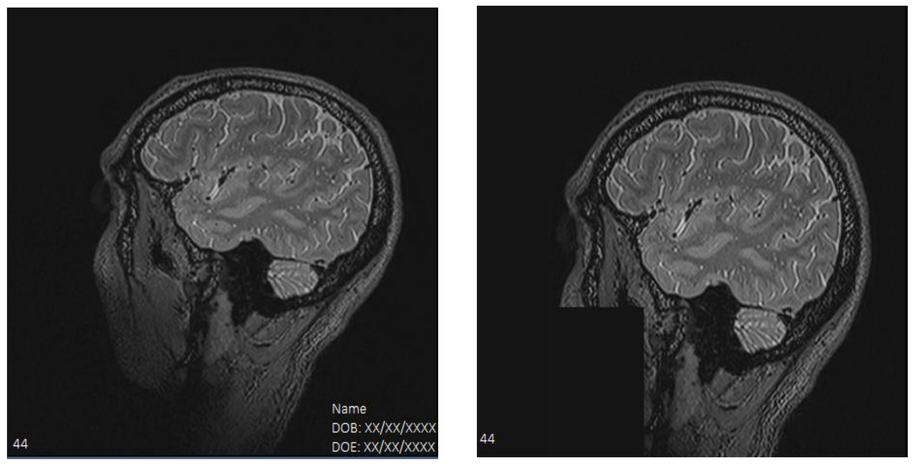
MRI brain images are of interest to those researching visual impairment due to intracranial pressure (VIIP) in the astronaut population. These images are stored in NASA's Electronic Medical Record (EMR) system as image sets. Each image set contains non-medical personally identifiable information (PII) such as name, date of birth, and date of exam. Automated software programs are available that have been shown to successfully de-identify MRI brain image sets; however, these software programs remove areas of interest (i.e. orbits) specific to VIIP.

Methods

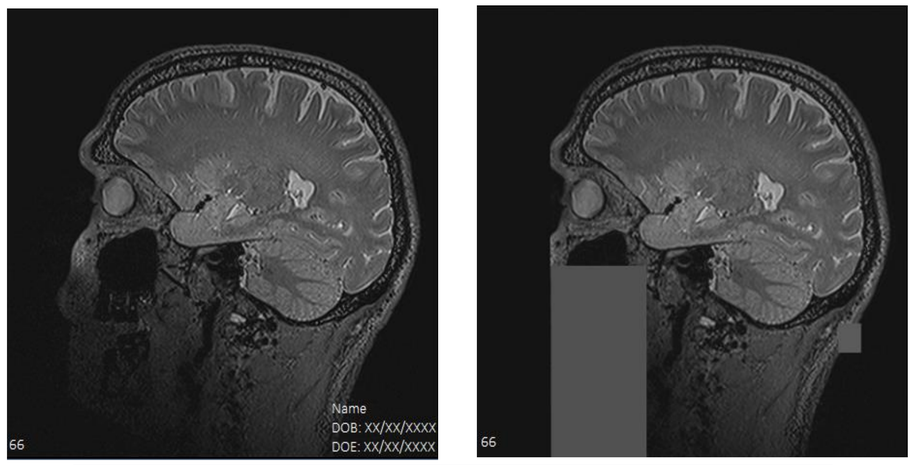
Synapse is the medical image-storing component of NASA's Electronic Medical Record (EMR). Each image set contains approximately 176 images that can be individually exported out of Synapse. These images can then be converted into a file type that is opened in Showcase Premier, a Digital Imaging and Communications in Medicine (DICOM) software package. Showcase allows for editing of one image manually, which can then be applied automatically to every image in the set. The 88th slice, of 176, represents the body's sagittal midline and is therefore the best image for editing.

Results

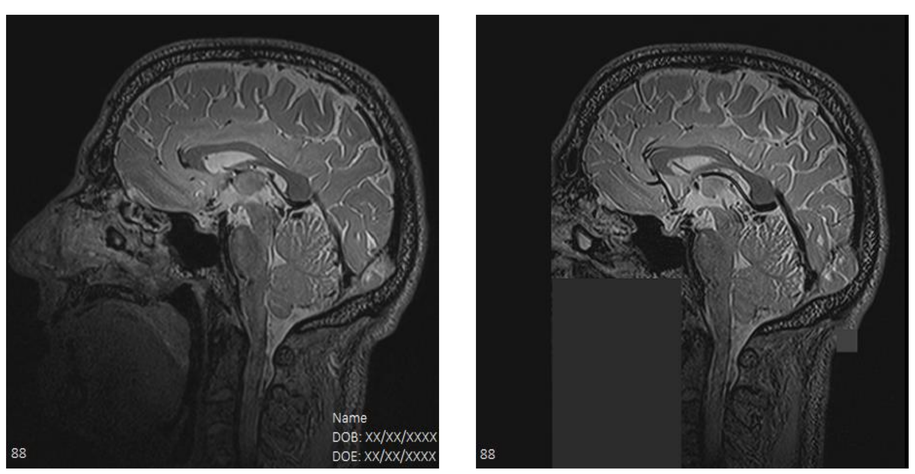
Pre De-Identified MRI Images | *Post De-Identified MRI Images*



44th Slice



66th Slice

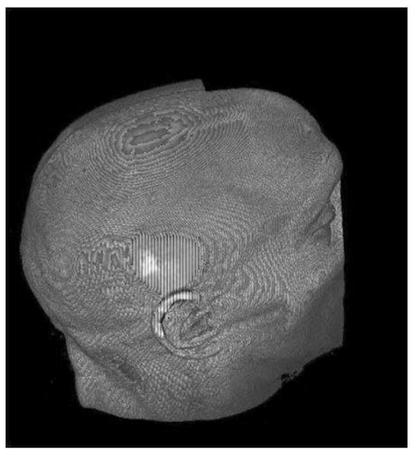


88th Slice

Results (continued)

Pre De-Identification 3-D Rendered Image [1]
(sagittal, axial, and coronal planes)

Post De-Identification 3-D Rendered Image



Discussion

This new approach to image de-identification will allow access to untapped VIIP-related medical imaging data. To verify that no data points of interest are compromised by the editing and that the images are 100% de-identified, three groups will review the images in the near future: Internal subject matter experts (SMEs), NASA-funded MRI researchers at academic institutions, and crowdsourcers via a "hack-a-thon."

References

[1] Schimke, N., Kuehler, M., & Hale, J. (2011). Preserving privacy in structural neuroimages. In Data and Applications Security and Privacy XXV (pp. 301-308). Springer Berlin Heidelberg.

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